REMARKS

The application has been amended and is believed to be in condition for allowance.

Claims 1-5 are pending with claims 1, 4, and 5 being independent.

The Official Action objected to the abstract. Responsively, the abstract has been amended.

The specification has been amended as to form.

Claims 1-5 stand rejected as obvious over CLARKE et al. 4,967,345 in view of BARTOLANZO, Jr. et al. 5,321,815.

For the reasons discussed below, CLARKE et al. is not believed to teach the features for which it has been offered. Indeed, CLARKE et al. teach methodology completely different from that of the present invention.

As the patent title suggests, and the Abstract summarizes, CLARKE et al. disclose a method of ***selecting least weight routes*** in a communications network. Additionally, the disclosed algorithm concerns the situation of selecting between a number of equally weighted paths to a particular (destination) node through different predecessor nodes to avoid always selecting the same route.

In a communications network, for a user at an origin node to exchange data with another user a destination node, a route must be set up through the network. The route will include

the node at which the first user is located (the origin node), the node at which the second user is located (the destination node), with intermediate nodes and the links/transmission groups which connect the nodes on the route.

CLARKE et al. take into account that real data communications networks include varying amounts of delays introduced over different routes. As a result, some types of transmission groups may cost more to use or introduce more delay than others. Thus, because nodes and transmission groups in a real network possess different characteristics, weights are assigned to both nodes and transmission groups.

The assigned weights are used in computing least weight routes through the network.

CLARKE et al. teach that in determining a "best" route through a network from a first user to a destination node, the weights of nodes and transmission groups in various potential routes are summed. The route having the lowest total weight is the least-weight route and is considered to be the "best" route to the destination node.

Thus, CLARKE et al. teach methodology based on costs weights for determining least-weight routes (least cost routes).

Additionally, CLARKE et al. note that for an origin node and a destination node, a least weight route computation algorithm always computes a single least weight path from the

origin node to the destination node. CLARKE et al. point out that there may be multiple paths of the same least weight between the origin and destination nodes. CLARKE et al. then point out that if ties between multiple paths are always broken in the same way during computation of a route, the algorithm will again always select the same path for every route request. This creates a problem in that one of the multiple, equally-weighted paths may potentially be overloaded to the exclusion of other least weight paths and the other paths will not be fully utilized for no justifiable reason.

The teachings of CLARKE et al. are directed to ***more effectively selecting different routes from a set of equally-weighted routes during route computation.*** The disclosure includes building a route computation tree from a selected root (current origin) node.

In building a tree from the root node, the method looks forward into the network and establishes a set of network node/transmission group ***pairs*** connecting network nodes not yet in the tree to the root node.

Next, the weights of paths from the root node in the tree to each node in the set are calculated. The node with the least weight path from the root node is added to the tree as follows:

if there is only one path from the root node to a given destination node with a least weight, that path is selected; and

if multiple paths from the root node to the given destination node have equal least weights, one of those multiple paths is selected in a quasi-random operation.

The selected node and transmission group connecting it to the tree are transferred to the tree. The steps are repeated until all nodes in the network have been transferred to the tree.

Reference is made to Figure 1, a flow chart of a least weight route computation method and to Figures 2-9.

See that unlike the present invention which finds plural shared-route paths ***from origin nodes to a single given destination node,*** Figure 1 creates a least weight tree mapping least weight routes ***from a root (origin) node to every other node in a network***. These are opposites.

The present invention begins by identifying a path set of routes (paths) from origin nodes to the single destination node, and compares the paths to final common portions, thereby reducing the number of routes in the path set.

CLARKE et al., in contrast, build a single tree, a node at a time, starting with the origin root node until every node is in the tree. The result of CLARKE et al. is a tree that includes several branches from the root node to different nodes in the network. Again, remember, weighting of nodes and

interconnections between nodes is used in determining route weighting.

The method begins with an origin root node and computing the weight of possible paths from the root node through the tree. The next node having the least weight path from the root node is transferred to the tree (operation 18). As a result, the route tree is built up one branch or node connection at a time until every node in the network is included on the tree.

Figures 2-8 illustrate this method.

Figure 2 is a map of a network including six nodes A, B, C, D, E and F interconnected by transmission groups TG1 through TG8. Figure 3 is a table of weights arbitrarily assigned to the nodes and the transmission groups (normally the weights reflect costs corresponding to the nodes and interconnecting transmission groups).

Originally, the origin root node is node A. Since there are no predecessor nodes or transmission groups for the root node, the root node is automatically transferred to the tree with the path weight being the weight assigned to the root node.

In step 1, the nodes connected to node A (nodes B, C and D) are added to Set S and the weight of the paths to each of these nodes is calculated.

Route Computation Steps

Step	Tree	Set S Node	TPN	TPTG	TW
1	A	B	A	TG1	19 (8+5+6)
		C	A	TG2	31 (8+15+8)
		D	A	TG3	30 (8+20+2)

Node B has the least weight path to node A (19 equals the sum of the individual weights including the end nodes A and B and intermediate link TG1). Node B is therefore transferred to the tree, which tree now consists of the single branch (Figure 4).

In step 2, nodes connected to newly-added node B are identified (nodes A and F). The weight of the path to node F via node B is calculated and compared to the other path weights:

Route Computation Steps

Step	Tree	Set S Node	TPN	TPTG	TW
2	AB	C	A	TG2	31
		D	A	TG3	30
		F	B	TG4	33

As the A-D node path has the least weight value, node D is transferred to the tree (Figure 5).

In step 3, nodes connected to last added node D (nodes A, C and E) are identified. The weights are:

Route Computation Steps

	Set S				
Step	Tree	Node	TPN	TPTG	TW
3	ABD	C	A	TG2	31
		F	B	TG4	33
		E	D	TG7	41
		C	D	TG6	53

Since the path to node C via node A has the least weight of any of the paths, node C is transferred to the tree (Figure 6).

In step 4, node F (via node B) is transferred to the tree (Figure 7). In step 5, node E (via node D) is transferred to the tree (Figure 8). The method terminates with the least weight tree shown in Figure 8.

In this example, there were no equally weighted paths leading to a destination. In a typical data communications network, several equally weighted paths may lead to a particular node. Figures 9-10 illustrate if two or more sets of equally weighted paths lead to a particular node through different predecessor nodes.

Figure 9 illustrates a six node network (nodes A through F) with interconnecting, weighted transmission groups (zero weights are associated with the nodes). Figure 10 is a portion of a route computation table showing the weights assigned to different paths from origin root node (A) to a destination node F. The table and the network map shows there are four equally weighted routes between node A and node F. CLARKE et al.

teach that when routing to the particular (destination) node, e.g. node F, the relative numbers of equally weighted routes through different predecessor nodes determines the probability with which a route will be selected through the particular predecessor node.

The present invention starts with a set of routes, each of the routes extending from one of the plural ingress nodes to the single common egress node.

See the express recitation of determining the set in claim 1 and that there is a set in the other independent claims.

CLARKE et al. do not teach this and need not due to the methodology of CLARKE et al.

In the pending claims, e.g., claim 1, a route is recited as starting from each of the plural ingress nodes, via the connection nodes, to the single common egress node. In CLARKE et al., there is no set of such routes.

For this reason alone, the obviousness rejection is not believed to be viable.

Further, in contrast to the approach of CLARKE et al., the presently-pending claims each recite, in the preamble, "plural ingress nodes, [and] a single egress node". To clarify the nature of the routes, each of the independent claims has been amended to recite that the plural routes have a common egress node.

CLARKE et al. do not teach methodology directed to such routing and the obviousness rejection is therefore again not viable. Indeed, CLARKE et al. teach away from the present method in that the CLARKE et al. method is builds a single tree, built node by node, based at weights and not, as recited, by comparing complete routes and evaluating common routing between routes.

Also, CLARKE et al. teach focusing at the starting node and building toward all ending nodes, whereas the claims start at the plural starting nodes and works toward a single ending node. Path segments and nodes are added to the developing tree of CLARKE et al., each added segment/node being based on selecting between available path segment/nodes, the selected segment/node being the segment/node with the least weight.

CLARKE et al. fail to teach adding a predetermined point to a score of a route successively selected from a set of plural routes, each of the routes starting with one of the ingress nodes and ending with the single egress node.

Again, CLARKE et al. teach that "when computing least weight routes, the tree is built a node at a time starting with the root node until every node is in the tree. A tree normally includes several branches from the root node to different [egress] nodes in the network."

This is in direct contradiction to the recited method of the present invention wherein the focus is generating trees

from among routes, based on shared routing between a common node (a node common between two routes) and the common egress node. Each of the independent claims has been amended to clarify this feature.

The wherein clause of each independent claim recites the conditions for scoring the routes. That is, wherein the predetermined point is added to the route score whenever satisfying either of

(1) a first condition that any node, except the egress node, in a selected route does not appear on another route and,

(2) a second condition that, when there is a common node, in addition to said egress node, which appears in both said selected and another routes, and said selected route agrees with said another route from said common node to said egress node.

CLARKE et al. do not disclose this scheme.

CLARKE et al. do not add a predetermined point to the routes. CLARKE et al. only add weights (which are different), the weights are not equivalent to the recite predetermined point.

CLARKE et al. teach an "Operation 12" that computes the weight of possible paths from the root node through the tree. As discussed above, CLARKE et al. teach computing the sum of the weight assigned to the root node itself, and route segment being considered, and the node associated with the route segment. Thus, the point is not added a score of a route, as recited.

Thus, for this additional reason the obviousness rejection is not believed to be viable.

The claims recite selecting routes in reverse order of the ***route*** scores. In contrast, CLARKE et al. build a tree segment-by-segment where each next segment/node is added based on building onto current ending nodes. This is not selecting ***routes*** in reverse order of the route scores.

Further, since CLARKE et al. complete the routing task with a single tree, there is no reason to form additional trees. Therefore the teachings of BARTOLANZO, Jr. et al. do not motivate any modification, at least as relevant to the pending claims, to CLARKE et al.

In view of the above, reconsideration and allowance of all the pending claims are respectfully requested. Applicant believes that the present application is in condition for allowance and an early indication of the same is respectfully requested.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any

overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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APPENDIX:

The Appendix includes the following item:

- an amended Abstract of the Disclosure